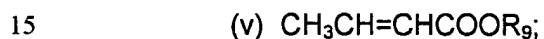
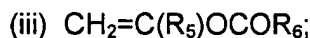
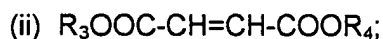
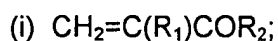


I claim:

1. An aqueous emulsion comprising a water-dispersible copolymer which is non-dispersible in aqueous solutions containing 0.5% or more of an inorganic salt, wherein the water-dispersible copolymer comprises in percentages by weight:

(A) from about 10% to about 90% of an acidic ethylenically unsaturated monomer; and

(B) from about 10% to about 90% of an ethylenically unsaturated monomer selected from the group of monomer formulas consisting of:



wherein R_1 is hydrogen or methyl and R_2 is $-\text{OZ}'$ or $-\text{N}(\text{Z}'')(\text{Z}'')$, wherein Z' is an alkyl group having from 1 to 7 carbon atoms, and Z'' is independently selected from the group consisting of hydrogen and alkyl groups having from 1 to 6 carbon atoms; R_3 and R_4 are independently hydrogen or an alkyl group having from 1 to 7 carbon atoms, with the proviso that R_3 and R_4 are not both hydrogen; R_5 is hydrogen or methyl and R_6 is an alkyl group having

from 1 to 7 carbon atoms; R₇ and R₈ are independently hydrogen or an alkyl group having from 1 to 7 carbon atoms, with the proviso that R₇ and R₈ are not both hydrogen; R₉ is an alkyl group having from 1 to 7 carbon atoms; R₁₀ and R₁₁ are hydrogen; R₁₂ and R₁₃ are independently selected from the group consisting of hydrogen, -CN, -NHCHO, -NHCOCH₃, and an alkyl group having from 1 to 7 carbon atoms; and the copolymer has a weight average molecular weight greater than about 25,000 and is present in an amount from about 20% to about 70%.

10 2. The aqueous emulsion according to claim 1, wherein the acidic ethylenically unsaturated monomer from (A) is a carboxylic acid group selected from the group consisting of acrylic acid, methacrylic acid, maleic acid, maleic acid half esters, maleic anhydride, itaconic acid, and crotonic acid.

15 3. The aqueous emulsion according to claim 1, wherein the acidic ethylenically unsaturated monomer from (A) is a sulfonic acid group selected from the group consisting of styrene sulfonic acid, 2-acrylamido-2-methylpropane sulfonic acid, and sodium vinyl sulfonate.

20 4. The aqueous emulsion according to claim 1, wherein the acidic ethylenically unsaturated monomer from (A) is a phosphoric acid group selected from the group consisting of styrene phosphoric acid, sodium vinyl

phosphonate, and $\text{CH}_2=\text{C}(\text{CH}_3)\text{COO}(\text{CH}_2)_n\text{OPO}_3\text{H}$, wherein n is from 2 to 4.

5. The aqueous emulsion according to claim 1, wherein the ethylenically unsaturated monomer from (B) is (i) $\text{CH}_2=\text{C}(\text{R}_1)\text{COR}_2$, wherein
5 R_1 is methyl and R_2 is $-\text{OZ}'$, wherein Z' is an alkyl group having from 1 to 4 carbon atoms.

6. The aqueous emulsion according to claim 1, wherein the ethylenically unsaturated monomer from (B) is (ii) $\text{R}_3\text{OOC}-\text{CH}=\text{CH}-\text{COOR}_4$,
10 wherein R_3 and R_4 are independently an alkyl group having from 1 to 4 carbon atoms.

7. The aqueous emulsion according to claim 1, wherein the ethylenically unsaturated monomer from (B) is (iii) $\text{CH}_2=\text{C}(\text{R}_5)\text{OCOR}_6$,
15 wherein R_5 is methyl and R_6 is an alkyl group having from 1 to 4 carbon atoms.

8. The aqueous emulsion according to claim 1, wherein the ethylenically unsaturated monomer from (B) is (iv)
20 $\text{CH}_2=\text{C}(\text{COOR}_7)\text{CH}_2\text{COOR}_8$, wherein R_7 and R_8 are independently an alkyl group having from 1 to 4 carbon atoms.

9. The aqueous emulsion according to claim 1, wherein the ethylenically unsaturated monomer from (B) is (v) $\text{CH}_3\text{CH}=\text{CHCOOR}_9$, wherein R_9 is an alkyl group having from 1 to 4 carbon atoms.

5 10. The aqueous emulsion according to claim 1, wherein the ethylenically unsaturated monomer from (B) is (vi) styrene.

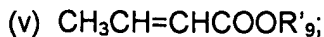
 11. The aqueous emulsion according to claim 1, wherein the ethylenically unsaturated monomer from (B) is (vii) $\text{R}_{12}\text{CH}=\text{CHR}_{13}$, wherein
10 R_{12} and R_{13} are independently hydrogen or methyl.

 12. An aqueous emulsion comprising a water-dispersible copolymer which is non-dispersible in aqueous solutions containing 0.5% or more of an inorganic salt, wherein the water-dispersible copolymer
15 comprises in percentages by weight:

(A) from about 10% to about 90% of an acidic ethylenically unsaturated monomer; and

(B) from about 10% to about 90% of an ethylenically unsaturated monomer selected from the group of monomer formulas consisting of:

- 20 (i) $\text{CH}_2=\text{C}(\text{R}'_1)\text{COR}'_2$;
 (ii) $\text{R}'_3\text{OOC}-\text{CH}=\text{CH}-\text{COOR}'_4$;
 (iii) $\text{CH}_2=\text{C}(\text{R}'_5)\text{OCOR}'_6$;



5 wherein R'_1 is hydrogen or methyl, and R'_2 is selected from the group consisting of $-\text{OZ}'$, $-\text{N}(\text{Z}'')(\text{Z}'')$, and $-\text{OZ}'''\text{OH}$, wherein Z' is an alkyl group having from 8 to 18 carbon atoms; Z'' is independently selected from the group consisting of alkyl groups having from 7 to 10 carbon atoms, dimethylamino alkyl groups having from 1 to 5 carbon atoms, and
10 hydroxyalkyl groups having from 1 to 5 carbon atoms; and Z''' is an alkyl group having from 1 to 4 carbon atoms; R'_3 and R'_4 are independently an alkyl group having from 8 to 18 carbon atoms; R'_5 is hydrogen or methyl and R'_6 is an alkyl group having from 8 to 18 carbon atoms; R'_7 and R'_8 are independently an alkyl group having from 8 to 18 carbon atoms; R'_9 is an
15 alkyl group having from 8 to 18 carbon atoms; R'_{10} and R'_{11} are independently an alkyl group having from 1 to 2 carbon atoms; R'_{12} and R'_{13} are independently selected from the group consisting of 2-pyrrolidinone, N-caprolactam, 2-pyridine, 3-pyridine, 4-pyridine, and an alkyl group having from 7 to 18 carbon atoms, with the proviso that R_{12} and R_{13} are not at the
20 same time 2-pyrrolidinone, N-caprolactam, 2-pyridine, 3-pyridine, or 4-pyridine; and the copolymer has a weight average molecular weight greater than about 25,000 and is present in an amount from about 20% to about 70%.

13. The aqueous emulsion according to claim 12, wherein the acidic ethylenically unsaturated monomer from (A) is a carboxylic acid group selected from the group consisting of acrylic acid, methacrylic acid, maleic acid, maleic acid half esters, maleic anhydride, itaconic acid, and crotonic acid.

14. The aqueous emulsion according to claim 12, wherein the acidic ethylenically unsaturated monomer from (A) is a sulfonic acid group selected from the group consisting of styrene sulfonic acid, 2-acrylamido-2-methylpropane sulfonic acid, and sodium vinyl sulfonate.

15. The aqueous emulsion according to claim 12, wherein the acidic ethylenically unsaturated monomer from (A) is a phosphoric acid group selected from the group consisting of styrene phosphoric acid, sodium vinyl phosphonate, and $\text{CH}_2=\text{C}(\text{CH}_3)\text{COO}(\text{CH}_2)_n\text{OPO}_3\text{H}$, wherein n is from 2 to 4.

16. The aqueous emulsion according to claim 12, wherein the ethylenically unsaturated monomer from (B) is (i) $\text{CH}_2=\text{C}(\text{R}'_1)\text{COR}'_2$, wherein R'_1 is methyl, R'_2 is selected from the group consisting of $-\text{OZ}'$, $-\text{N}(\text{Z}'')(\text{Z}'')$, and $-\text{OZ}'''\text{OH}$, wherein Z' is an alkyl group having from 8 to 12 carbon atoms; Z'' is independently selected from the group consisting of alkyl groups

having from 8 to 10 carbon atoms, dimethylamino alkyl groups having from 1 to 3 carbon atoms, and hydroxyalkyl groups having from 1 to 3 carbon atoms; and Z''' is an alkyl group having from 1 to 2 carbon atoms.

5 17. The aqueous emulsion according to claim 12, wherein the ethylenically unsaturated monomer from (B) is (ii) $R'_3OOC-CH=CH-COOR'_4$, wherein R'_3 and R'_4 are independently an alkyl group having from 8 to 12 carbon atoms.

10 18. The aqueous emulsion according to claim 12, wherein the ethylenically unsaturated monomer from (B) is (iii) $CH_2=C(R'_5)OCOR'_6$, wherein R'_5 is methyl, and R'_6 is an alkyl group having from 8 to 12 carbon atoms.

15 19. The aqueous emulsion according to claim 12, wherein the ethylenically unsaturated monomer from (B) is (iv) $CH_2=C(COOR'_7)CH_2COOR'_8$, wherein R'_7 and R'_8 are independently an alkyl group having from 8 to 12 carbon atoms.

20 20. The aqueous emulsion according to claim 12, wherein the ethylenically unsaturated monomer from (B) is (v) $CH_3CH=CHCOOR'_9$, and R'_9 is an alkyl group having from 8 to 12 carbon atoms.

21. The aqueous emulsion according to claim 12, wherein the ethylenically unsaturated monomer from (B) is (vi) $R'_{10}C_6H_4CR'_{11}=CHR'_{11}$, and R'_{10} and R'_{11} are independently methyl.

5

22. The aqueous emulsion according to claim 12, wherein the ethylenically unsaturated monomer from (B) is (vii) $R'_{12}CH=CHR'_{13}$, wherein R'_{12} and R'_{13} are independently selected from the group consisting of 2-pyrrolidinone, N-caprolactam, 2-pyridine, 3-pyridine, 4-pyridine, and an alkyl group having from 7 to 12 carbon atoms.

10

23. An aqueous emulsion comprising a water-dispersible copolymer which is non-dispersible in aqueous solutions containing 0.5% or more of an inorganic salt, wherein the water-dispersible copolymer comprises in percentages by weight:

15

(A) from about 10% to about 80% of an acidic ethylenically unsaturated monomer, with the proviso that the acidic ethylenically unsaturated monomer is not acrylic acid;

(B) from about 10% to about 80% of an ethylenically unsaturated monomer selected from the group of monomer formulas consisting of:

20



- (iii) $\text{CH}_2=\text{C}(\text{R}_5)\text{OCOR}_6$;
- (iv) $\text{CH}_2=\text{C}(\text{COOR}_7)\text{CH}_2\text{COOR}_8$;
- (v) $\text{CH}_3\text{CH}=\text{CHCOOR}_9$;
- (vi) $\text{R}_{10}\text{C}_6\text{H}_4\text{CR}_{11}=\text{CHR}_{11}$; and
- 5 (vii) $\text{R}_{12}\text{CH}=\text{CHR}_{13}$;

wherein R_1 is hydrogen or methyl and R_2 is $-\text{OZ}'$ or $-\text{N}(\text{Z}'')(\text{Z}''')$, wherein Z' is an alkyl group having from 1 to 7 carbon atoms, and Z'' is independently selected from the group consisting of hydrogen and alkyl groups having from 1 to 6 carbon atoms; R_3 and R_4 are independently hydrogen or an alkyl group having from 1 to 7 carbon atoms, with the proviso that R_3 and R_4 are not both hydrogen; R_5 is hydrogen or methyl and R_6 is an alkyl group having from 1 to 7 carbon atoms; R_7 and R_8 are independently hydrogen or an alkyl group having from 1 to 7 carbon atoms, with the proviso that R_7 and R_8 are not both hydrogen; R_9 is an alkyl group having from 1 to 7 carbon atoms; R_{10} and R_{11} are hydrogen; and R_{12} and R_{13} are independently selected from the group consisting of hydrogen, $-\text{CN}$, $-\text{NHCHO}$, and an alkyl group having from 1 to 7 carbon atoms; and

(C) from about 10% to about 80% of an ethylenically unsaturated monomer selected from the group of monomer formulas consisting of:

- 20 (i) $\text{CH}_2=\text{C}(\text{R}'_1)\text{COR}'_2$;
- (ii) $\text{R}'_3\text{OOC}-\text{CH}=\text{CH}-\text{COOR}'_4$;
- (iii) $\text{CH}_2=\text{C}(\text{R}'_5)\text{OCOR}'_6$;

(iv) $\text{CH}_2=\text{C}(\text{COOR}'_7)\text{CH}_2\text{COOR}'_8$;

(v) $\text{CH}_3\text{CH}=\text{CHCOOR}'_9$;

(vi) $\text{R}'_{10}\text{C}_6\text{H}_4\text{CR}'_{11}=\text{CHR}'_{11}$; and

(vii) $\text{R}'_{12}\text{CH}=\text{CHR}'_{13}$;

5 wherein R'_1 is hydrogen or methyl, and R'_2 is selected from the group consisting of $-\text{OZ}'$, $-\text{N}(\text{Z}'')(\text{Z}'')$, and $-\text{OZ}'''\text{OH}$, wherein Z' is an alkyl group having from 8 to 18 carbon atoms; Z'' is independently selected from the group consisting of alkyl groups having from 7 to 10 carbon atoms, dimethylamino alkyl groups having from 1 to 5 carbon atoms, and
10 hydroxyalkyl groups having from 1 to 5 carbon atoms; and Z''' is an alkyl group having from 1 to 4 carbon atoms; R'_3 and R'_4 are independently an alkyl group having from 8 to 18 carbon atoms; R'_5 is hydrogen or methyl and R'_6 is an alkyl group having from 8 to 18 carbon atoms; R'_7 and R'_8 are independently an alkyl group having from 8 to 18 carbon atoms; R'_9 is an
15 alkyl group having from 8 to 18 carbon atoms; R'_{10} and R'_{11} are independently an alkyl group having from 1 to 2 carbon atoms; R'_{12} and R'_{13} are independently selected from the group consisting of 2-pyrrolidinone, N-caprolactam, and an alkyl group having from 7 to 18 carbon atoms, with the proviso that R_{12} and R_{13} are not both 2-pyrrolidinone, are not both N-caprolactam, or are not a mixture thereof; and the copolymer has a weight
20 average molecular weight greater than about 25,000 and is present in an amount from about 20% to about 70%.

24. The aqueous emulsion according to claim 23, wherein the acidic ethylenically unsaturated monomer from (A) is a carboxylic acid group selected from the group consisting of methacrylic acid, maleic acid, maleic acid half esters, maleic anhydride, itaconic acid, and crotonic acid.

25. The aqueous emulsion according to claim 23, wherein the acidic ethylenically unsaturated monomer from (A) is a sulfonic acid group selected from the group consisting of styrene sulfonic acid, 2-acrylamido-2-methylpropane sulfonic acid, and sodium vinyl sulfonate.

26. The aqueous emulsion according to claim 23, wherein the acidic ethylenically unsaturated monomer from (A) is a phosphoric acid group selected from the group consisting of styrene phosphoric acid, sodium vinyl phosphonate, and $\text{CH}_2=\text{C}(\text{CH}_3)\text{COO}(\text{CH}_2)_n\text{OPO}_3\text{H}$, wherein n is from 2 to 4.

27. The aqueous emulsion according to claim 23, wherein the ethylenically unsaturated monomer from (B) is (i) $\text{CH}_2=\text{C}(\text{R}_1)\text{COR}_2$, wherein R_1 is methyl and R_2 is $-\text{OZ}'$, wherein Z' is an alkyl group having from 1 to 4 carbon atoms.

28. The aqueous emulsion according to claim 23, wherein the ethylenically unsaturated monomer from (B) is (ii) $R_3OOC-CH=CH-COOR_4$, wherein R_3 and R_4 are independently an alkyl group having from 2 to 4 carbon atoms.

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29. The aqueous emulsion according to claim 23, wherein the ethylenically unsaturated monomer from (B) is (iii) $CH_2=C(R_5)OCOR_6$, wherein R_5 is methyl and R_6 is an alkyl group having from 1 to 4 carbon atoms.

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30. The aqueous emulsion according to claim 23, wherein the ethylenically unsaturated monomer from (B) is (iv) $CH_2=C(COOR_7)CH_2COOR_8$, wherein R_7 and R_8 are independently an alkyl group having from 2 to 4 carbon atoms.

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31. The aqueous emulsion according to claim 23, wherein the ethylenically unsaturated monomer from (B) is (v) $CH_3CH=CHCOOR_9$, wherein R_9 is an alkyl group having from 2 to 4 carbon atoms.

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32. The aqueous emulsion according to claim 23, wherein the ethylenically unsaturated monomer from (B) is (vi) $R_{10}C_6H_4CR_{11}=CHR_{11}$, wherein R_{10} and R_{11} are hydrogen.

33. The aqueous emulsion according to claim 23, wherein the ethylenically unsaturated monomer from (B) is (vii) $R_{12}CH=CHR_{13}$, wherein R_{12} and R_{13} are independently hydrogen or methyl.

5

34. The aqueous emulsion according to claim 23, wherein the ethylenically unsaturated monomer from (C) is (i) $CH_2=C(R'_1)COR'_2$, wherein R'_1 is methyl, R'_2 is selected from the group consisting of $-OZ'$, $-N(Z'')(Z'')$, and $-OZ'''OH$, wherein Z' is an alkyl group having from 8 to 12 carbon atoms; Z'' is independently selected from the group consisting of alkyl groups having from 8 to 10 carbon atoms, dimethylamino alkyl groups having from 1 to 3 carbon atoms, and hydroxyalkyl groups having from 1 to 3 carbon atoms; and Z''' is an alkyl group having from 1 to 2 carbon atoms.

10

35. The aqueous emulsion according to claim 23, wherein the ethylenically unsaturated monomer from (C) is (ii) $R'_3OOC-CH=CH-COOR'_4$, wherein R'_3 and R'_4 are independently an alkyl group having from 8 to 12 carbon atoms.

15

36. The aqueous emulsion according to claim 23, wherein the ethylenically unsaturated monomer from (C) is (iii) $CH_2=C(R'_5)OCOR'_6$, wherein R'_5 is methyl, and R'_6 is an alkyl group having from 8 to 12 carbon atoms.

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37. The aqueous emulsion according to claim 23, wherein the ethylenically unsaturated monomer from (C) is (iv) $\text{CH}_2=\text{C}(\text{COOR}'_7)\text{CH}_2\text{COOR}'_8$, wherein R'_7 and R'_8 are independently an alkyl group having from 8 to 12 carbon atoms.

38. The aqueous emulsion according to claim 23, wherein the ethylenically unsaturated monomer from (C) is (v) $\text{CH}_3\text{CH}=\text{CHCOOR}'_9$, and R'_9 is an alkyl group having from 8 to 12 carbon atoms.

39. The aqueous emulsion according to claim 23, wherein the ethylenically unsaturated monomer from (C) is (vi) $\text{R}'_{10}\text{C}_6\text{H}_4\text{CR}'_{11}=\text{CHR}'_{11}$, and R'_{10} and R'_{11} have 1 carbon atom.

40. The aqueous emulsion according to claim 23, wherein the ethylenically unsaturated monomer from (C) is (vii) $\text{R}'_{12}\text{CH}=\text{CHR}'_{13}$, wherein R'_{12} and R'_{13} are independently selected from the group consisting of 2-pyrrolidinone, N-caprolactam, and an alkyl group having from 7 to 12 carbon atoms.

41. A method for preparing an aqueous emulsion comprising a water-dispersible copolymer which is non-dispersible in aqueous solutions containing 0.5% or more of an inorganic salt, comprising the steps of:

(a) providing the following monomers in percentages by weight;

(A) from about 10% to about 90% of an acidic ethylenically unsaturated monomer; and

(B) from about 10% to about 90% of an ethylenically unsaturated monomer selected from the group of monomer formulas consisting of:

(i) $\text{CH}_2=\text{C}(\text{R}_1)\text{COR}_2$;

(ii) $\text{R}_3\text{OOC}-\text{CH}=\text{CH}-\text{COOR}_4$;

(iii) $\text{CH}_2=\text{C}(\text{R}_5)\text{OCOR}_6$;

(iv) $\text{CH}_2=\text{C}(\text{COOR}_7)\text{CH}_2\text{COOR}_8$;

(v) $\text{CH}_3\text{CH}=\text{CHCOOR}_9$;

(vi) $\text{R}_{10}\text{C}_6\text{H}_4\text{CR}_{11}=\text{CHR}_{11}$; and

(vii) $\text{R}_{12}\text{CH}=\text{CHR}_{13}$;

wherein R_1 is hydrogen or methyl and R_2 is $-\text{OZ}'$ or $-\text{N}(\text{Z}'')(\text{Z}'')$, wherein Z' is an alkyl group having from 1 to 7 carbon atoms, and Z'' is independently selected from the group consisting of hydrogen and alkyl groups having from 1 to 6 carbon atoms; R_3 and R_4 are independently hydrogen or an alkyl group having from 1 to 7 carbon atoms, with the proviso that R_3 and R_4 are not both hydrogen; R_5 is hydrogen or methyl and R_6 is an alkyl group having from 1 to 7 carbon atoms; R_7 and R_8 are independently hydrogen or an alkyl group having from 1 to 7 carbon atoms, with the proviso that R_7 and R_8 are not both hydrogen; R_9 is an alkyl group having from 1 to 7 carbon atoms; R_{10} and R_{11} are hydrogen; R_{12} and R_{13} are independently selected from the group consisting of hydrogen, $-\text{CN}$, $-\text{NHCHO}$, $-\text{NHCOCH}_3$, and an alkyl

group having from 1 to 7 carbon atoms; and the copolymer has a weight average molecular weight greater than about 25,000 and is present in an amount from about 20% to about 70%; and

5 (b) emulsion polymerizing the monomers from (A) and (B) in water at a solids level from about 20% to about 70% in the presence of a surfactant.

42. The method according to claim 41, wherein the acidic ethylenically unsaturated monomer from (A) is selected from the group
10 consisting of acrylic acid, methacrylic acid, maleic acid, maleic acid half esters, maleic anhydride, itaconic acid, crotonic acid, styrene sulfonic acid, 2-acrylamido-2-methylpropane sulfonic acid, sodium vinyl sulfonate, styrene phosphoric acid, sodium vinyl phosphonate, and $\text{CH}_2=\text{C}(\text{CH}_3)\text{COO}(\text{CH}_2)_n\text{OPO}_3\text{H}$, wherein n is from 2 to 4.

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43. The method according to claim 41, wherein the ethylenically unsaturated monomer from (B) is selected from the group consisting of:

- (i) $\text{CH}_2=\text{C}(\text{R}_1)\text{COR}_2$, wherein R_1 is methyl and R_2 is $-\text{OZ}'$, wherein Z' is an alkyl group having from 1 to 4 carbon atoms;
- 20 (ii) $\text{R}_3\text{OOC}-\text{CH}=\text{CH}-\text{COOR}_4$, wherein R_3 and R_4 are independently an alkyl group having from 1 to 4 carbon atoms;
- (iii) $\text{CH}_2=\text{C}(\text{R}_5)\text{OCOR}_6$, wherein R_5 is methyl and R_6 is an alkyl group having from 1 to 4 carbon atoms;

(iv) $\text{CH}_2=\text{C}(\text{COOR}_7)\text{CH}_2\text{COOR}_8$, wherein R_7 and R_8 are independently an alkyl group having from 1 to 4 carbon atoms;

(v) $\text{CH}_3\text{CH}=\text{CHCOOR}_9$, wherein R_9 is an alkyl group having from 1 to 4 carbon atoms;

5 (vi) styrene; and

(vii) $\text{R}_{12}\text{CH}=\text{CHR}_{13}$, wherein R_{12} and R_{13} are independently hydrogen or methyl.

44. A method for preparing an aqueous emulsion comprising a
10 water-dispersible copolymer which is non-dispersible in aqueous solutions containing 0.5% or more of an inorganic salt, comprising the steps of:

(a) providing the following monomers in percentages by weight;

(A) from about 10% to about 90% of an acidic ethylenically unsaturated monomer; and

15 (B) from about 10% to about 90% of an ethylenically unsaturated monomer selected from the group of monomer formulas consisting of:

(i) $\text{CH}_2=\text{C}(\text{R}_1)\text{COR}_2$;

(ii) $\text{R}_3\text{OOC}-\text{CH}=\text{CH}-\text{COOR}_4$;

(iii) $\text{CH}_2=\text{C}(\text{R}_5)\text{OCOR}_6$;

20 (iv) $\text{CH}_2=\text{C}(\text{COOR}_7)\text{CH}_2\text{COOR}_8$;

(v) $\text{CH}_3\text{CH}=\text{CHCOOR}_9$;

(vi) $\text{R}_{10}\text{C}_6\text{H}_4\text{CR}_{11}=\text{CHR}_{11}$; and

(vii) $R_{12}CH=CHR_{13}$;

wherein R_1 is hydrogen or methyl and R_2 is $-OZ'$ or $-N(Z'')(Z''')$, wherein Z' is an alkyl group having from 1 to 7 carbon atoms, and Z'' is independently selected from the group consisting of hydrogen and alkyl groups having from
5 1 to 6 carbon atoms; R_3 and R_4 are independently hydrogen or an alkyl group having from 1 to 7 carbon atoms, with the proviso that R_3 and R_4 are not both hydrogen; R_5 is hydrogen or methyl and R_6 is an alkyl group having from 1 to 7 carbon atoms; R_7 and R_8 are independently hydrogen or an alkyl group having from 1 to 7 carbon atoms, with the proviso that R_7 and R_8 are
10 not both hydrogen; R_9 is an alkyl group having from 1 to 7 carbon atoms; R_{10} and R_{11} are hydrogen; R_{12} and R_{13} are independently selected from the group consisting of hydrogen, $-CN$, $-NHCHO$, $-NHCOCH_3$, and an alkyl group having from 1 to 7 carbon atoms; and the copolymer has a weight average molecular weight greater than about 25,000 and is present in an
15 amount from about 20% to about 70%; and

(b) neutralizing the monomers from (A) and (B) in water to a level from about 2% to about 15% molar of the acidic ethylenically unsaturated monomer from (A); and

(c) emulsion polymerizing the monomers from (A) and (B) at a
20 solids level from about 20% to about 70% without a surfactant.

45. The method according to claim 44, wherein the acidic ethylenically unsaturated monomer from (A) is selected from the group

consisting of acrylic acid, methacrylic acid, maleic acid, maleic acid half esters, maleic anhydride, itaconic acid, crotonic acid, styrene sulfonic acid, 2-acrylamido-2-methylpropane sulfonic acid, sodium vinyl sulfonate, styrene phosphoric acid, sodium vinyl phosphonate, and
5 $\text{CH}_2=\text{C}(\text{CH}_3)\text{COO}(\text{CH}_2)_n\text{OPO}_3\text{H}$, wherein n is from 2 to 4.

46. The method according to claim 44, wherein the ethylenically unsaturated monomer from (B) is selected from the group consisting of:
- (i) $\text{CH}_2=\text{C}(\text{R}_1)\text{COR}_2$, wherein R_1 is methyl and R_2 is $-\text{OZ}'$, wherein Z' is an
10 alkyl group having from 1 to 4 carbon atoms;
 - (ii) $\text{R}_3\text{OOC}-\text{CH}=\text{CH}-\text{COOR}_4$, wherein R_3 and R_4 are independently an alkyl group having from 1 to 4 carbon atoms;
 - (iii) $\text{CH}_2=\text{C}(\text{R}_5)\text{OCOR}_6$, wherein R_5 is methyl and R_6 is an alkyl group having from 1 to 4 carbon atoms;
 - 15 (iv) $\text{CH}_2=\text{C}(\text{COOR}_7)\text{CH}_2\text{COOR}_8$, wherein R_7 and R_8 are independently an alkyl group having from 1 to 4 carbon atoms;
 - (v) $\text{CH}_3\text{CH}=\text{CHCOOR}_9$, wherein R_9 is an alkyl group having from 1 to 4 carbon atoms;
 - (vi) styrene; and
 - 20 (vii) $\text{R}_{12}\text{CH}=\text{CHR}_{13}$, wherein R_{12} and R_{13} are independently hydrogen or methyl.

47. A method for preparing an aqueous emulsion comprising a water-dispersible copolymer which is non-dispersible in aqueous solutions containing 0.5% or more of an inorganic salt, comprising the steps of:

(a) providing the following monomers in percentages by weight;

5 (A) from about 10% to about 90% of an acidic ethylenically unsaturated monomer; and

(B) from about 10% to about 90% of an ethylenically unsaturated monomer selected from the group of monomer formulas consisting of:

(i) $\text{CH}_2=\text{C}(\text{R}'_1)\text{COR}'_2$;

10 (ii) $\text{R}'_3\text{OOC}-\text{CH}=\text{CH}-\text{COOR}'_4$;

(iii) $\text{CH}_2=\text{C}(\text{R}'_5)\text{OCOR}'_6$;

(iv) $\text{CH}_2=\text{C}(\text{COOR}'_7)\text{CH}_2\text{COOR}'_8$;

(v) $\text{CH}_3\text{CH}=\text{CHCOOR}'_9$;

(vi) $\text{R}'_{10}\text{C}_6\text{H}_4\text{CR}'_{11}=\text{CHR}'_{11}$; and

15 (vii) $\text{R}'_{12}\text{CH}=\text{CHR}'_{13}$;

wherein R'_1 is hydrogen or methyl, and R'_2 is selected from the group consisting of $-\text{OZ}'$, $-\text{N}(\text{Z}'')(\text{Z}'')$, and $-\text{OZ}'''\text{OH}$, wherein Z' is an alkyl group having from 8 to 18 carbon atoms; Z'' is independently selected from the group consisting of alkyl groups having from 7 to 10 carbon atoms, dimethylamino alkyl groups having from 1 to 5 carbon atoms, and hydroxyalkyl groups having from 1 to 5 carbon atoms; and Z''' is an alkyl group having from 1 to 4 carbon atoms; R'_3 and R'_4 are independently an alkyl group having from 8 to 18 carbon atoms; R'_5 is hydrogen or methyl and

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R'₆ is an alkyl group having from 8 to 18 carbon atoms; R'₇ and R'₈ are independently an alkyl group having from 8 to 18 carbon atoms; R'₉ is an alkyl group having from 8 to 18 carbon atoms; R'₁₀ and R'₁₁ are independently an alkyl group having from 1 to 2 carbon atoms; R'₁₂ and R'₁₃ are independently selected from the group consisting of 2-pyrrolidinone, N-caprolactam, 2-pyridine, 3-pyridine, 4-pyridine, and an alkyl group having from 7 to 18 carbon atoms, with the proviso that R'₁₂ and R'₁₃ are not at the same time 2-pyrrolidinone, N-caprolactam, 2-pyridine, 3-pyridine, or 4-pyridine; and the copolymer has a weight average molecular weight greater than about 25,000 and is present in an amount from about 20% to about 70%; and

(b) emulsion polymerizing the monomers from (A) and (B) in water at a solids level from about 20% to about 70% in the presence of a surfactant.

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48. The method according to claim 47, wherein the acidic ethylenically unsaturated monomer from (A) is selected from the group consisting of acrylic acid, methacrylic acid, maleic acid, maleic acid half esters, maleic anhydride, itaconic acid, crotonic acid, styrene sulfonic acid, 2-acrylamido-2-methylpropane sulfonic acid, sodium vinyl sulfonate, styrene phosphoric acid, sodium vinyl phosphonate, and $\text{CH}_2=\text{C}(\text{CH}_3)\text{COO}(\text{CH}_2)_n\text{OPO}_3\text{H}$, wherein n is from 2 to 4.

49. The method according to claim 47, wherein the ethylenically unsaturated monomer from (B) is selected from the group consisting of:
- (i) $\text{CH}_2=\text{C}(\text{R}'_1)\text{COR}'_2$, wherein R'_1 is methyl, R'_2 is selected from the group consisting of $-\text{OZ}'$, $-\text{N}(\text{Z}'')(\text{Z}'')$, and $-\text{OZ}'''\text{OH}$, wherein Z' is an alkyl group having from 8 to 12 carbon atoms; Z'' is independently selected from the group consisting of alkyl groups having from 8 to 10 carbon atoms, dimethylamino alkyl groups having from 1 to 3 carbon atoms, and hydroxyalkyl groups having from 1 to 3 carbon atoms; and Z''' is an alkyl group having from 1 to 2 carbon atoms;
 - (ii) $\text{R}'_3\text{OOC}-\text{CH}=\text{CH}-\text{COOR}'_4$, wherein R'_3 and R'_4 are independently an alkyl group having from 8 to 12 carbon atoms;
 - (iii) $\text{CH}_2=\text{C}(\text{R}'_5)\text{OCOR}'_6$, wherein R'_5 is methyl, and R'_6 is an alkyl group having from 8 to 12 carbon atoms;
 - (iv) $\text{CH}_2=\text{C}(\text{COOR}'_7)\text{CH}_2\text{COOR}'_8$, wherein R'_7 and R'_8 are independently an alkyl group having from 8 to 12 carbon atoms;
 - (v) $\text{CH}_3\text{CH}=\text{CHCOOR}'_9$, and R'_9 is an alkyl group having from 8 to 12 carbon atoms;
 - (vi) $\text{R}'_{10}\text{C}_6\text{H}_4\text{CR}'_{11}=\text{CHR}'_{11}$, and R'_{10} and R'_{11} are independently methyl; and
 - (vii) $\text{R}'_{12}\text{CH}=\text{CHR}'_{13}$, wherein R'_{12} and R'_{13} are independently selected from the group consisting of 2-pyrrolidinone, N-caprolactam, 2-pyridine, 3-pyridine, 4-pyridine, and an alkyl group having from 7 to 12 carbon atoms.

50. A method for preparing an aqueous emulsion comprising a water-dispersible copolymer which is non-dispersible in aqueous solutions containing 0.5% or more of an inorganic salt, comprising the steps of:

5 (a) providing the following monomers in percentages by weight;

(A) from about 10% to about 90% of an acidic ethylenically unsaturated monomer; and

(B) from about 10% to about 90% of an ethylenically unsaturated monomer selected from the group of monomer formulas consisting of:

- 10 (i) $\text{CH}_2=\text{C}(\text{R}'_1)\text{COR}'_2$;
(ii) $\text{R}'_3\text{OOC}-\text{CH}=\text{CH}-\text{COOR}'_4$;
(iii) $\text{CH}_2=\text{C}(\text{R}'_5)\text{OCOR}'_6$;
(iv) $\text{CH}_2=\text{C}(\text{COOR}'_7)\text{CH}_2\text{COOR}'_8$;
(v) $\text{CH}_3\text{CH}=\text{CHCOOR}'_9$;
15 (vi) $\text{R}'_{10}\text{C}_6\text{H}_4\text{CR}'_{11}=\text{CHR}'_{11}$; and
(vii) $\text{R}'_{12}\text{CH}=\text{CHR}'_{13}$;

wherein R'_1 is hydrogen or methyl, and R'_2 is selected from the group consisting of $-\text{OZ}'$, $-\text{N}(\text{Z}'')(\text{Z}'')$, and $-\text{OZ}'''\text{OH}$, wherein Z' is an alkyl group having from 8 to 18 carbon atoms; Z'' is independently selected from the
20 group consisting of alkyl groups having from 7 to 10 carbon atoms, dimethylamino alkyl groups having from 1 to 5 carbon atoms, and hydroxyalkyl groups having from 1 to 5 carbon atoms; and Z''' is an alkyl group having from 1 to 4 carbon atoms; R'_3 and R'_4 are independently an

alkyl group having from 8 to 18 carbon atoms; R'₅ is hydrogen or methyl and R'₆ is an alkyl group having from 8 to 18 carbon atoms; R'₇ and R'₈ are independently an alkyl group having from 8 to 18 carbon atoms; R'₉ is an alkyl group having from 8 to 18 carbon atoms; R'₁₀ and R'₁₁ are
5 independently an alkyl group having from 1 to 2 carbon atoms; R'₁₂ and R'₁₃ are independently selected from the group consisting of 2-pyrrolidinone, N-caprolactam, 2-pyridine, 3-pyridine, 4-pyridine, and an alkyl group having from 7 to 18 carbon atoms, with the proviso that R'₁₂ and R'₁₃ are not at the same time 2-pyrrolidinone, N-caprolactam, 2-pyridine, 3-pyridine, or 4-
10 pyridine; and the copolymer has a weight average molecular weight greater than about 25,000 and is present in an amount from about 20% to about 70%; and

(b) neutralizing the monomers from (A) and (B) in water to a level from about 2% to about 15% molar of the acidic ethylenically unsaturated
15 monomer from (A); and

(c) emulsion polymerizing the monomers from (A) and (B) at a solids level from about 20% to about 70% without a surfactant.

51. The method according to claim 50, wherein the acidic
20 ethylenically unsaturated monomer from (A) is selected from the group consisting of acrylic acid, methacrylic acid, maleic acid, maleic acid half esters, maleic anhydride, itaconic acid, crotonic acid, styrene sulfonic acid, 2-acrylamido-2-methylpropane sulfonic acid, sodium vinyl sulfonate, styrene

phosphoric acid, sodium vinyl phosphonate, and $\text{CH}_2=\text{C}(\text{CH}_3)\text{COO}(\text{CH}_2)_n\text{OPO}_3\text{H}$, wherein n is from 2 to 4.

52. The method according to claim 50, wherein the ethylenically unsaturated monomer from (B) is selected from the group consisting of:
- 5 (i) $\text{CH}_2=\text{C}(\text{R}'_1)\text{COR}'_2$, wherein R'_1 is methyl, R'_2 is selected from the group consisting of $-\text{OZ}'$, $-\text{N}(\text{Z}'')(\text{Z}'')$, and $-\text{OZ}'''\text{OH}$, wherein Z' is an alkyl group having from 8 to 12 carbon atoms; Z'' is independently selected from the group consisting of alkyl groups having from 8 to 10 carbon atoms, dimethylamino alkyl groups having from 1 to 3 carbon atoms, and hydroxyalkyl groups having from 1 to 3 carbon atoms; and Z''' is an alkyl group having from 1 to 2 carbon atoms;
- 10 (ii) $\text{R}'_3\text{OOC}-\text{CH}=\text{CH}-\text{COOR}'_4$, wherein R'_3 and R'_4 are independently an alkyl group having from 8 to 12 carbon atoms;
- 15 (iii) $\text{CH}_2=\text{C}(\text{R}'_5)\text{OCOR}'_6$, wherein R'_5 is methyl, and R'_6 is an alkyl group having from 8 to 12 carbon atoms;
- (iv) $\text{CH}_2=\text{C}(\text{COOR}'_7)\text{CH}_2\text{COOR}'_8$, wherein R'_7 and R'_8 are independently an alkyl group having from 8 to 12 carbon atoms;
- (v) $\text{CH}_3\text{CH}=\text{CHCOOR}'_9$, and R'_9 is an alkyl group having from 8 to 12 carbon atoms;
- 20 (vi) $\text{R}'_{10}\text{C}_6\text{H}_4\text{CR}'_{11}=\text{CHR}'_{11}$, and R'_{10} and R'_{11} are independently methyl; and
- (vii) $\text{R}'_{12}\text{CH}=\text{CHR}'_{13}$, wherein R'_{12} and R'_{13} are independently selected from the group consisting of 2-pyrrolidinone, N-caprolactam, 2-pyridine, 3-

pyridine, 4-pyridine, and an alkyl group having from 7 to 12 carbon atoms.

53. A method for preparing an aqueous emulsion comprising a water-dispersible copolymer which is non-dispersible in aqueous solutions containing 0.5% or more of an inorganic salt, comprising the steps of:

(a) providing the following monomers in percentages by weight;

(A) from about 10% to about 80% of an acidic ethylenically unsaturated monomer;

(B) from about 10% to about 80% of an ethylenically unsaturated monomer selected from the group of monomer formulas consisting of:

(i) $\text{CH}_2=\text{C}(\text{R}_1)\text{COR}_2$;

(ii) $\text{R}_3\text{OOC}-\text{CH}=\text{CH}-\text{COOR}_4$;

(iii) $\text{CH}_2=\text{C}(\text{R}_5)\text{OCOR}_6$;

(iv) $\text{CH}_2=\text{C}(\text{COOR}_7)\text{CH}_2\text{COOR}_8$;

(v) $\text{CH}_3\text{CH}=\text{CHCOOR}_9$;

(vi) $\text{R}_{10}\text{C}_6\text{H}_4\text{CR}_{11}=\text{CHR}_{11}$; and

(vii) $\text{R}_{12}\text{CH}=\text{CHR}_{13}$;

wherein R_1 is hydrogen or methyl and R_2 is $-\text{OZ}'$ or $-\text{N}(\text{Z}'')(\text{Z}'')$, wherein Z' is an alkyl group having from 1 to 7 carbon atoms, and Z'' is independently selected from the group consisting of hydrogen and alkyl groups having from 1 to 6 carbon atoms; R_3 and R_4 are independently hydrogen or an alkyl group having from 1 to 7 carbon atoms, with the proviso that R_3 and R_4 are not both hydrogen; R_5 is hydrogen or methyl and R_6 is an alkyl group having

from 1 to 7 carbon atoms; R_7 and R_8 are independently hydrogen or an alkyl group having from 1 to 7 carbon atoms, with the proviso that R_7 and R_8 are not both hydrogen; R_9 is an alkyl group having from 1 to 7 carbon atoms; R_{10} and R_{11} are hydrogen; and R_{12} and R_{13} are independently selected from the group consisting of hydrogen, -CN, -NHCHO, and an alkyl group having from 1 to 7 carbon atoms; and

(C) from about 10% to about 80% of an ethylenically unsaturated monomer selected from the group of monomer formulas consisting of:

- (i) $CH_2=C(R'_1)COR'_2$;
- 10 (ii) $R'_3OOC-CH=CH-COOR'_4$;
- (iii) $CH_2=C(R'_5)OCOR'_6$;
- (iv) $CH_2=C(COOR'_7)CH_2COOR'_8$;
- (v) $CH_3CH=CHCOOR'_9$;
- (vi) $R'_{10}C_6H_4CR'_{11}=CHR'_{11}$; and
- 15 (vii) $R'_{12}CH=CHR'_{13}$;

wherein R'_1 is hydrogen or methyl, and R'_2 is selected from the group consisting of -OZ', -N(Z'')(Z'''), and -OZ'''OH, wherein Z' is an alkyl group having from 8 to 18 carbon atoms; Z'' is independently selected from the group consisting of alkyl groups having from 7 to 10 carbon atoms, dimethylamino alkyl groups having from 1 to 5 carbon atoms, and hydroxyalkyl groups having from 1 to 5 carbon atoms; and Z''' is an alkyl group having from 1 to 4 carbon atoms; R'_3 and R'_4 are independently an alkyl group having from 8 to 18 carbon atoms; R'_5 is hydrogen or methyl and

R'₆ is an alkyl group having from 8 to 18 carbon atoms; R'₇ and R'₈ are independently an alkyl group having from 8 to 18 carbon atoms; R'₉ is an alkyl group having from 8 to 18 carbon atoms; R'₁₀ and R'₁₁ are independently an alkyl group having from 1 to 2 carbon atoms; R'₁₂ and R'₁₃ are independently selected from the group consisting of 2-pyrrolidinone, N-caprolactam, and an alkyl group having from 7 to 18 carbon atoms, with the proviso that R'₁₂ and R'₁₃ are not both 2-pyrrolidinone, are not both N-caprolactam, or are not a mixture thereof; and the copolymer has a weight average molecular weight greater than about 25,000 and is present in an amount from about 20% to about 70%; and

(b) emulsion polymerizing the monomers from (A), (B), and (C) in water at a solids level from about 20% to about 70% in the presence of a surfactant.

54. The method according to claim 53, wherein the acidic ethylenically unsaturated monomer from (A) is selected from the group consisting of acrylic acid, methacrylic acid, maleic acid, maleic acid half esters, maleic anhydride, itaconic acid, crotonic acid, styrene sulfonic acid, 2-acrylamido-2-methylpropane sulfonic acid, sodium vinyl sulfonate, styrene phosphoric acid, sodium vinyl phosphonate, and $\text{CH}_2=\text{C}(\text{CH}_3)\text{COO}(\text{CH}_2)_n\text{OPO}_3\text{H}$, wherein n is from 2 to 4.

55. The method according to claim 53, wherein the ethylenically unsaturated monomer from (B) is selected from the group consisting of:

- (i) $\text{CH}_2=\text{C}(\text{R}_1)\text{COR}_2$, wherein R_1 is methyl and R_2 is $-\text{OZ}'$, wherein Z' is an alkyl group having from 1 to 4 carbon atoms;
- 5 (ii) $\text{R}_3\text{OOC}-\text{CH}=\text{CH}-\text{COOR}_4$, wherein R_3 and R_4 are independently an alkyl group having from 1 to 4 carbon atoms;
- (iii) $\text{CH}_2=\text{C}(\text{R}_5)\text{OCOR}_6$, wherein R_5 is methyl and R_6 is an alkyl group having from 1 to 4 carbon atoms;
- 10 (iv) $\text{CH}_2=\text{C}(\text{COOR}_7)\text{CH}_2\text{COOR}_8$, wherein R_7 and R_8 are independently an alkyl group having from 1 to 4 carbon atoms;
- (v) $\text{CH}_3\text{CH}=\text{CHCOOR}_9$, wherein R_9 is an alkyl group having from 1 to 4 carbon atoms;
- (vi) styrene; and
- (vii) $\text{R}_{12}\text{CH}=\text{CHR}_{13}$, wherein R_{12} and R_{13} are independently hydrogen or
15 methyl.

56. The method according to claim 53, wherein the ethylenically unsaturated monomer from (C) is selected from the group consisting of:

- (i) $\text{CH}_2=\text{C}(\text{R}'_1)\text{COR}'_2$, wherein R'_1 is methyl, R'_2 is selected from the group
20 consisting of $-\text{OZ}'$, $-\text{N}(\text{Z}'')(\text{Z}''')$, and $-\text{OZ}'''\text{OH}$, wherein Z' is an alkyl group having from 8 to 12 carbon atoms; Z'' is independently selected from the group consisting of alkyl groups having from 8 to 10 carbon atoms, dimethylamino alkyl groups having from 1 to 3 carbon atoms, and

hydroxyalkyl groups having from 1 to 3 carbon atoms; and Z''' is an alkyl group having from 1 to 2 carbon atoms;

(ii) $R'_3\text{OOC-CH=CH-COOR}'_4$, wherein R'_3 and R'_4 are independently an alkyl group having from 8 to 12 carbon atoms;

5 (iii) $\text{CH}_2=\text{C}(\text{R}'_5)\text{OCOR}'_6$, wherein R'_5 is methyl, and R'_6 is an alkyl group having from 8 to 12 carbon atoms;

(iv) $\text{CH}_2=\text{C}(\text{COOR}'_7)\text{CH}_2\text{COOR}'_8$, wherein R'_7 and R'_8 are independently an alkyl group having from 8 to 12 carbon atoms;

(v) $\text{CH}_3\text{CH=CHCOOR}'_9$, and R'_9 is an alkyl group having from 8 to 12 carbon
10 atoms;

(vi) $\text{R}'_{10}\text{C}_6\text{H}_4\text{CR}'_{11}=\text{CHR}'_{11}$, and R'_{10} and R'_{11} are independently methyl; and

(vii) $\text{R}'_{12}\text{CH=CHR}'_{13}$, wherein R'_{12} and R'_{13} are independently selected from the group consisting of 2-pyrrolidinone, N-caprolactam, 2-pyridine, 3-pyridine, 4-pyridine, and an alkyl group having from 7 to 12 carbon atoms.

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57. A method for preparing an aqueous emulsion comprising a water-dispersible copolymer which is non-dispersible in aqueous solutions containing 0.5% or more of an inorganic salt, comprising the steps of:

(a) providing the following monomers in percentages by weight;

20 (A) from about 10% to about 80% of an acidic ethylenically unsaturated monomer;

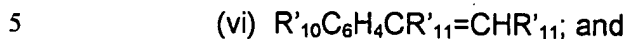
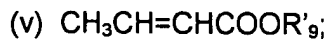
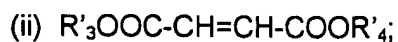
(B) from about 10% to about 80% of an ethylenically unsaturated monomer selected from the group of monomer formulas consisting of:

- (i) $\text{CH}_2=\text{C}(\text{R}_1)\text{COR}_2$;
- (ii) $\text{R}_3\text{OOC}-\text{CH}=\text{CH}-\text{COOR}_4$;
- (iii) $\text{CH}_2=\text{C}(\text{R}_5)\text{OCOR}_6$;
- (iv) $\text{CH}_2=\text{C}(\text{COOR}_7)\text{CH}_2\text{COOR}_8$;
- 5 (v) $\text{CH}_3\text{CH}=\text{CHCOOR}_9$;
- (vi) $\text{R}_{10}\text{C}_6\text{H}_4\text{CR}_{11}=\text{CHR}_{11}$; and
- (vii) $\text{R}_{12}\text{CH}=\text{CHR}_{13}$;

wherein R_1 is hydrogen or methyl and R_2 is $-\text{OZ}'$ or $-\text{N}(\text{Z}'')(\text{Z}''')$, wherein Z' is an alkyl group having from 1 to 7 carbon atoms, and Z'' is independently
 10 selected from the group consisting of hydrogen and alkyl groups having from 1 to 6 carbon atoms; R_3 and R_4 are independently hydrogen or an alkyl group having from 1 to 7 carbon atoms, with the proviso that R_3 and R_4 are not both hydrogen; R_5 is hydrogen or methyl and R_6 is an alkyl group having from 1 to 7 carbon atoms; R_7 and R_8 are independently hydrogen or an alkyl
 15 group having from 1 to 7 carbon atoms, with the proviso that R_7 and R_8 are not both hydrogen; R_9 is an alkyl group having from 1 to 7 carbon atoms; R_{10} and R_{11} are hydrogen; and R_{12} and R_{13} are independently selected from the group consisting of hydrogen, $-\text{CN}$, $-\text{NHCHO}$, and an alkyl group having from 1 to 7 carbon atoms; and

20 (C) from about 10% to about 80% of an ethylenically unsaturated monomer selected from the group of monomer formulas consisting of:

- (i) $\text{CH}_2=\text{C}(\text{R}'_1)\text{COR}'_2$;



wherein R'_1 is hydrogen or methyl, and R'_2 is selected from the group consisting of $-OZ'$, $-N(Z'')(Z'')$, and $-OZ'''OH$, wherein Z' is an alkyl group having from 8 to 18 carbon atoms; Z'' is independently selected from the
10 group consisting of alkyl groups having from 7 to 10 carbon atoms, dimethylamino alkyl groups having from 1 to 5 carbon atoms, and hydroxyalkyl groups having from 1 to 5 carbon atoms; and Z''' is an alkyl group having from 1 to 4 carbon atoms; R'_3 and R'_4 are independently an alkyl group having from 8 to 18 carbon atoms; R'_5 is hydrogen or methyl and
15 R'_6 is an alkyl group having from 8 to 18 carbon atoms; R'_7 and R'_8 are independently an alkyl group having from 8 to 18 carbon atoms; R'_9 is an alkyl group having from 8 to 18 carbon atoms; R'_{10} and R'_{11} are independently an alkyl group having from 1 to 2 carbon atoms; R'_{12} and R'_{13} are independently selected from the group consisting of 2-pyrrolidinone, N-caprolactam, and an alkyl group having from 7 to 18 carbon atoms, with the
20 proviso that R'_{12} and R'_{13} are not both 2-pyrrolidinone, are not both N-caprolactam, or are not a mixture thereof; and the copolymer has a weight average molecular weight greater than about 25,000 and is present in an

amount from about 20% to about 70%; and

(b) neutralizing the monomers from (A), (B), and (C) in water to a level from about 2% to about 15% molar of the acidic ethylenically unsaturated monomer from (A); and

5 (c) emulsion polymerizing the monomers from (A), (B), and (C) at a solids level from about 20% to about 70% without a surfactant.

58. The method according to claim 57, wherein the acidic ethylenically unsaturated monomer from (A) is selected from the group
10 consisting of acrylic acid, methacrylic acid, maleic acid, maleic acid half esters, maleic anhydride, itaconic acid, crotonic acid, styrene sulfonic acid, 2-acrylamido-2-methylpropane sulfonic acid, sodium vinyl sulfonate, styrene phosphoric acid, sodium vinyl phosphonate, and $\text{CH}_2=\text{C}(\text{CH}_3)\text{COO}(\text{CH}_2)_n\text{OPO}_3\text{H}$, wherein n is from 2 to 4.

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59. The method according to claim 57, wherein the ethylenically unsaturated monomer from (B) is selected from the group consisting of:

(i) $\text{CH}_2=\text{C}(\text{R}_1)\text{COR}_2$, wherein R_1 is methyl and R_2 is $-\text{OZ}'$, wherein Z' is an alkyl group having from 1 to 4 carbon atoms;

20 (ii) $\text{R}_3\text{OOC}-\text{CH}=\text{CH}-\text{COOR}_4$, wherein R_3 and R_4 are independently an alkyl group having from 1 to 4 carbon atoms;

(iii) $\text{CH}_2=\text{C}(\text{R}_5)\text{OCOR}_6$, wherein R_5 is methyl and R_6 is an alkyl group having from 1 to 4 carbon atoms;

- (iv) $\text{CH}_2=\text{C}(\text{COOR}_7)\text{CH}_2\text{COOR}_8$, wherein R_7 and R_8 are independently an alkyl group having from 1 to 4 carbon atoms;
- (v) $\text{CH}_3\text{CH}=\text{CHCOOR}_9$, wherein R_9 is an alkyl group having from 1 to 4 carbon atoms;
- 5 (vi) styrene; and
- (vii) $\text{R}_{12}\text{CH}=\text{CHR}_{13}$, wherein R_{12} and R_{13} are independently hydrogen or methyl.

60. The method according to claim 57, wherein the ethylenically
- 10 unsaturated monomer from (C) is selected from the group consisting of:
- (i) $\text{CH}_2=\text{C}(\text{R}'_1)\text{COR}'_2$, wherein R'_1 is methyl, R'_2 is selected from the group consisting of $-\text{OZ}'$, $-\text{N}(\text{Z}'')(\text{Z}'')$, and $-\text{OZ}'''\text{OH}$, wherein Z' is an alkyl group having from 8 to 12 carbon atoms; Z'' is independently selected from the group consisting of alkyl groups having from 8 to 10 carbon atoms,
- 15 dimethylamino alkyl groups having from 1 to 3 carbon atoms, and hydroxyalkyl groups having from 1 to 3 carbon atoms; and Z''' is an alkyl group having from 1 to 2 carbon atoms;
- (ii) $\text{R}'_3\text{OOC}-\text{CH}=\text{CH}-\text{COOR}'_4$, wherein R'_3 and R'_4 are independently an alkyl group having from 8 to 12 carbon atoms;
- 20 (iii) $\text{CH}_2=\text{C}(\text{R}'_5)\text{OCOR}'_6$, wherein R'_5 is methyl, and R'_6 is an alkyl group having from 8 to 12 carbon atoms;
- (iv) $\text{CH}_2=\text{C}(\text{COOR}'_7)\text{CH}_2\text{COOR}'_8$, wherein R'_7 and R'_8 are independently an alkyl group having from 8 to 12 carbon atoms;

(v) $\text{CH}_3\text{CH}=\text{CHCOOR}'_9$, and R'_9 is an alkyl group having from 8 to 12 carbon atoms;

(vi) $\text{R}'_{10}\text{C}_6\text{H}_4\text{CR}'_{11}=\text{CHR}'_{11}$, and R'_{10} and R'_{11} are independently methyl; and

(vii) $\text{R}'_{12}\text{CH}=\text{CHR}'_{13}$, wherein R'_{12} and R'_{13} are independently selected from
5 the group consisting of 2-pyrrolidinone, N-caprolactam, 2-pyridine, 3-pyridine, 4-pyridine, and an alkyl group having from 7 to 12 carbon atoms.